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(54) **ADJUSTABLE MULTI-BLADDER SYSTEM  
FOR AN ARTICLE OF FOOTWEAR**

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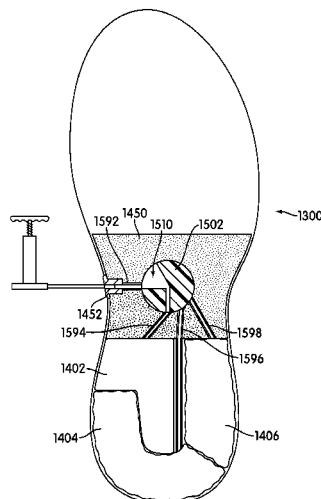
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(57)

#### ABSTRACT

An adjustable multiple bladder system for an article of foot-  
wear is disclosed. The bladder system includes an outer blad-  
der that may be inflated using an external pump. A valve  
member is disposed within the outer bladder and divides the  
outer bladder into two distinct inflation chambers. The infla-  
tion chambers may be inflated separately.

**20 Claims, 16 Drawing Sheets**



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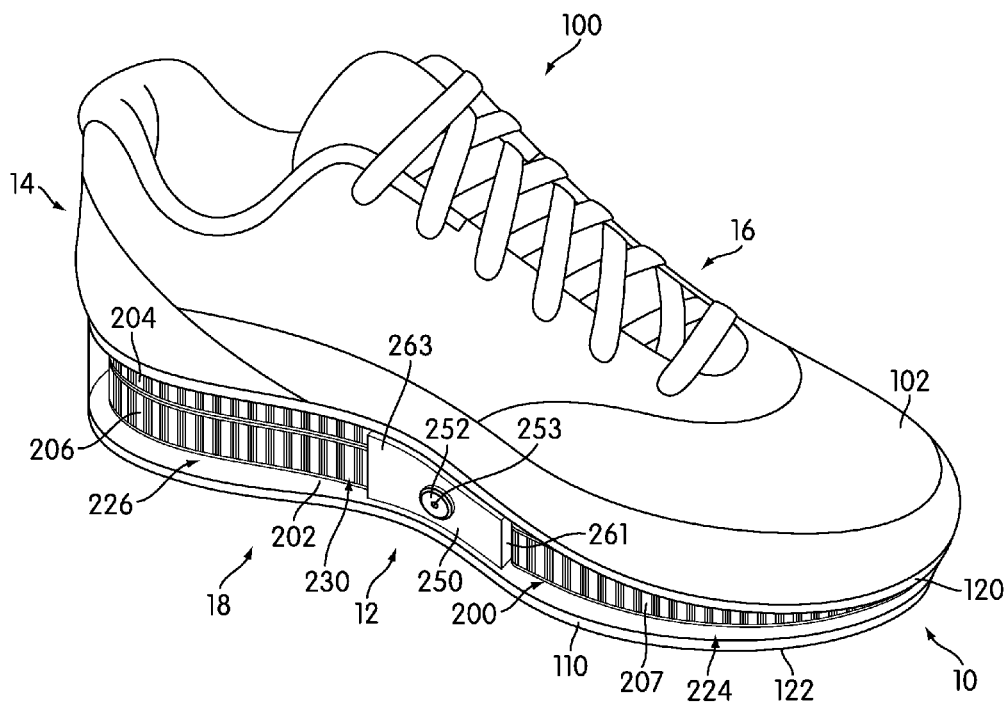
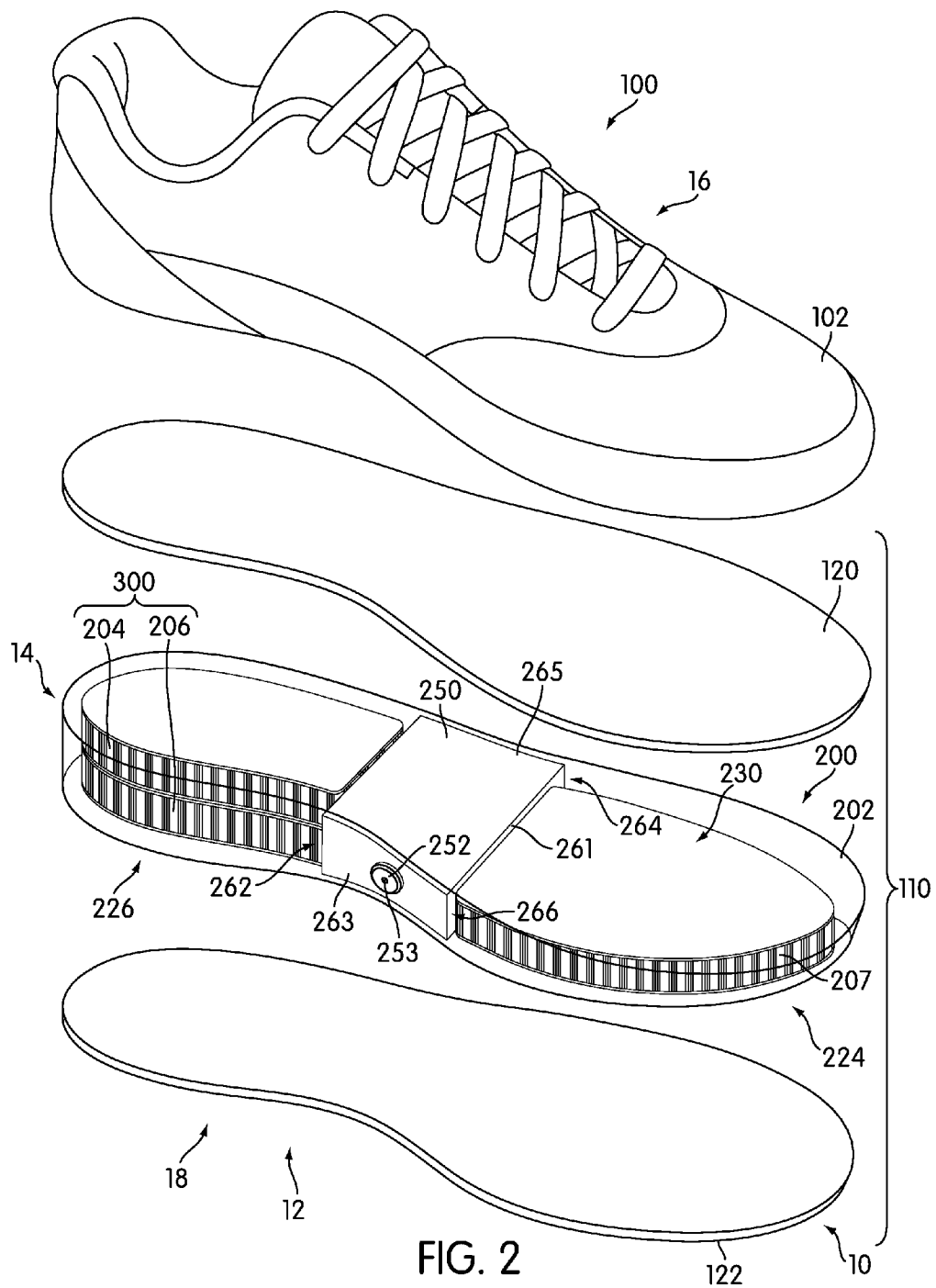


FIG. 1



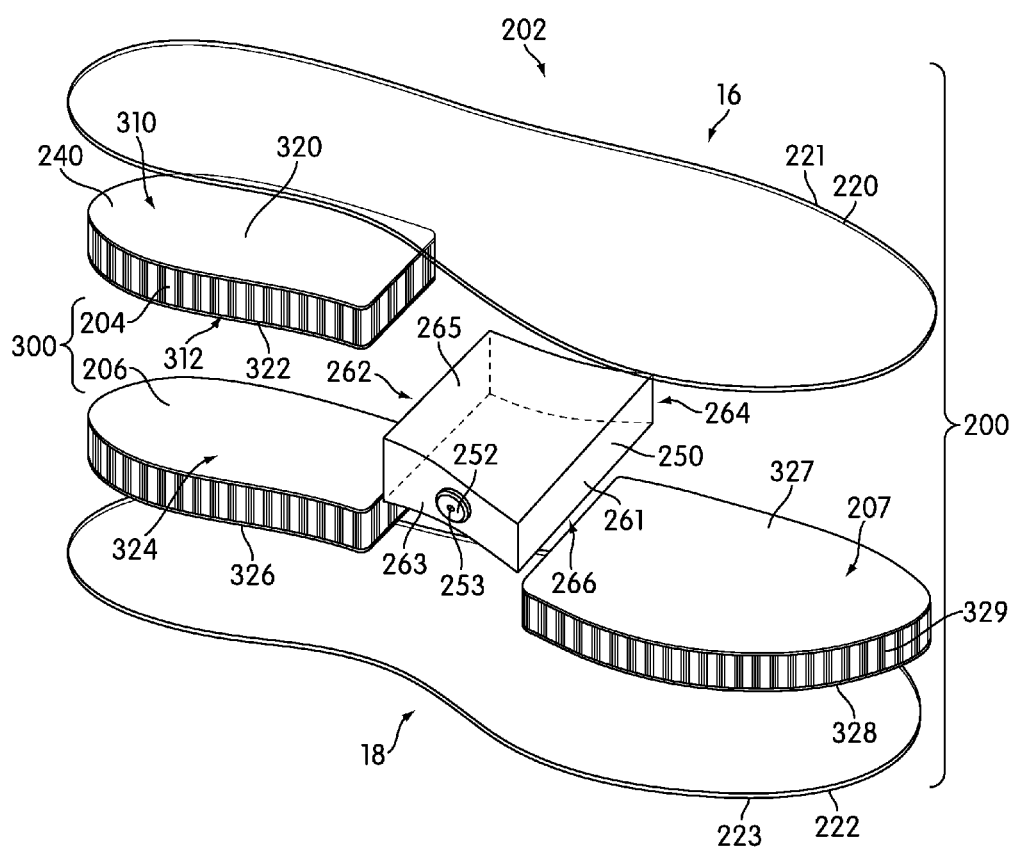


FIG. 3

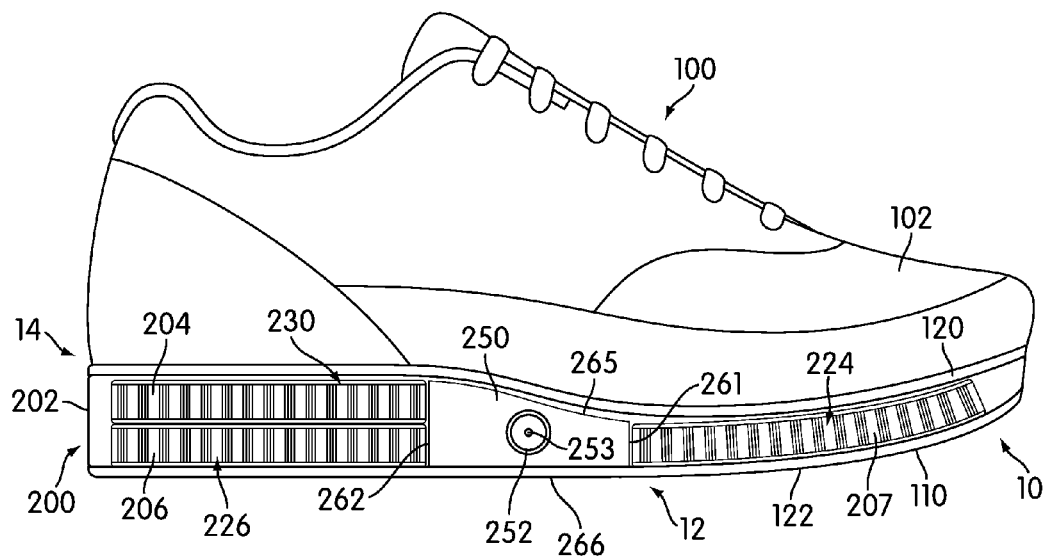


FIG. 4

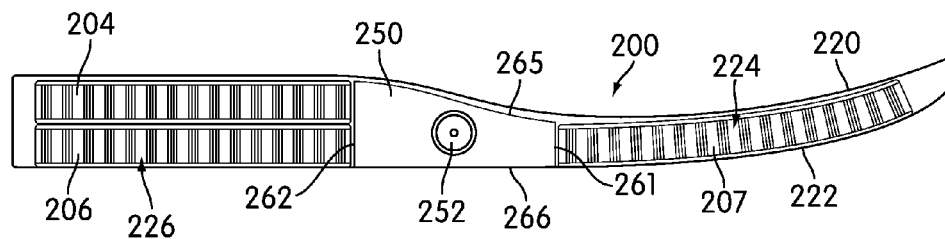


FIG. 5

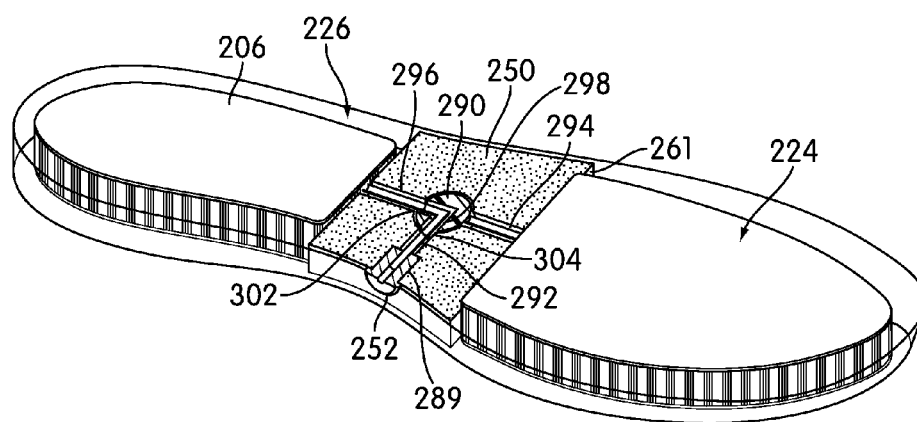


FIG. 6



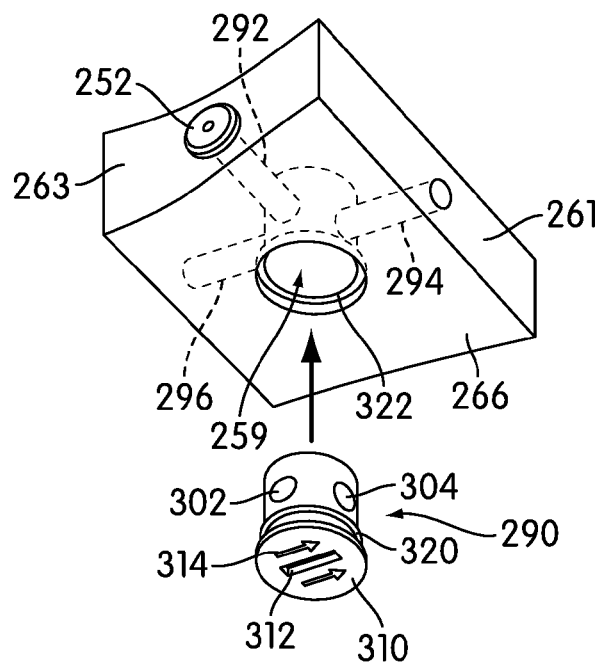


FIG. 7

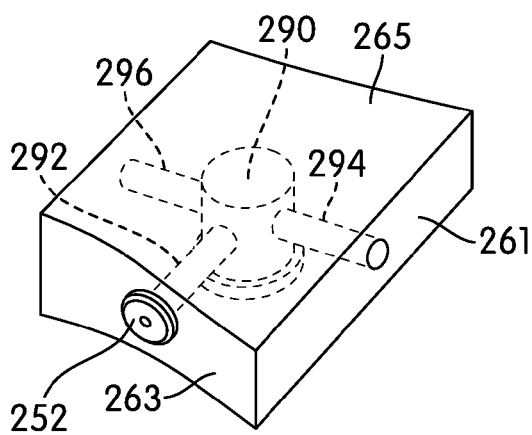


FIG. 8

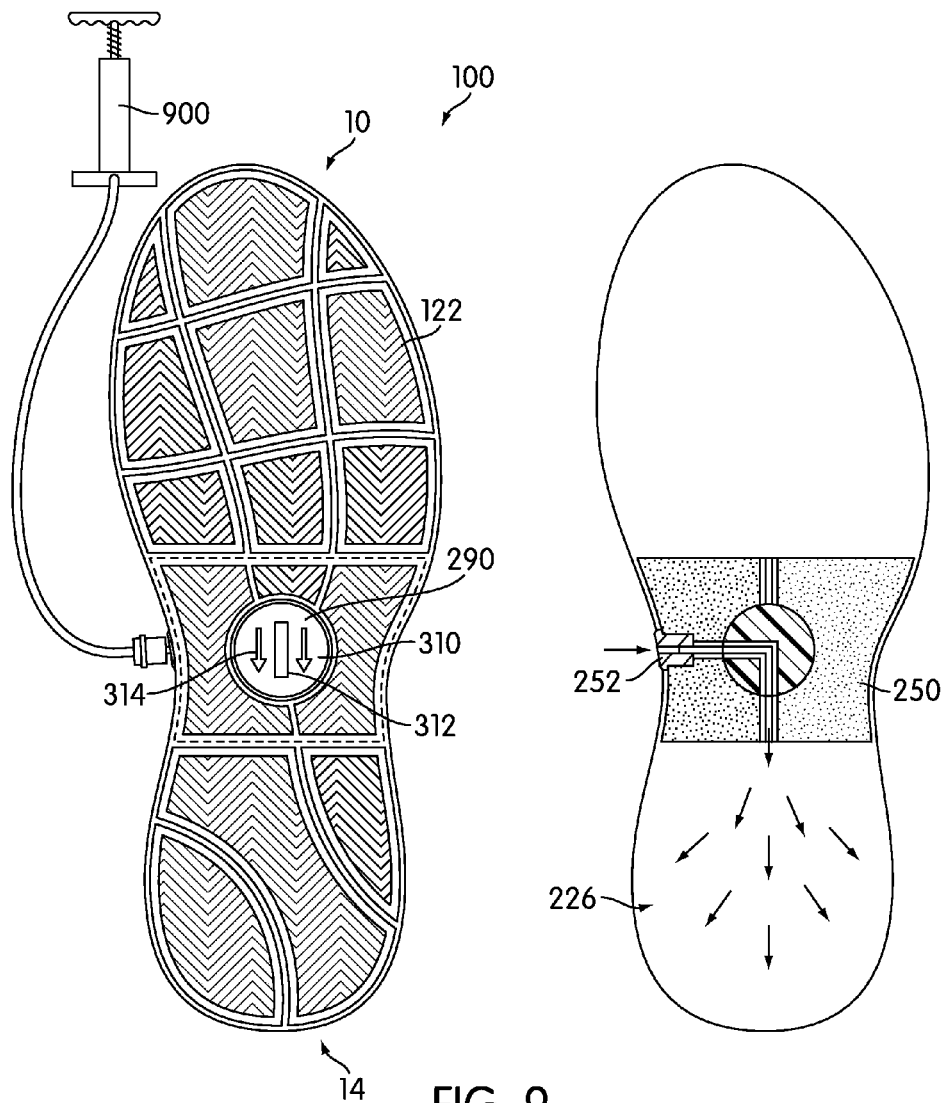


FIG. 9

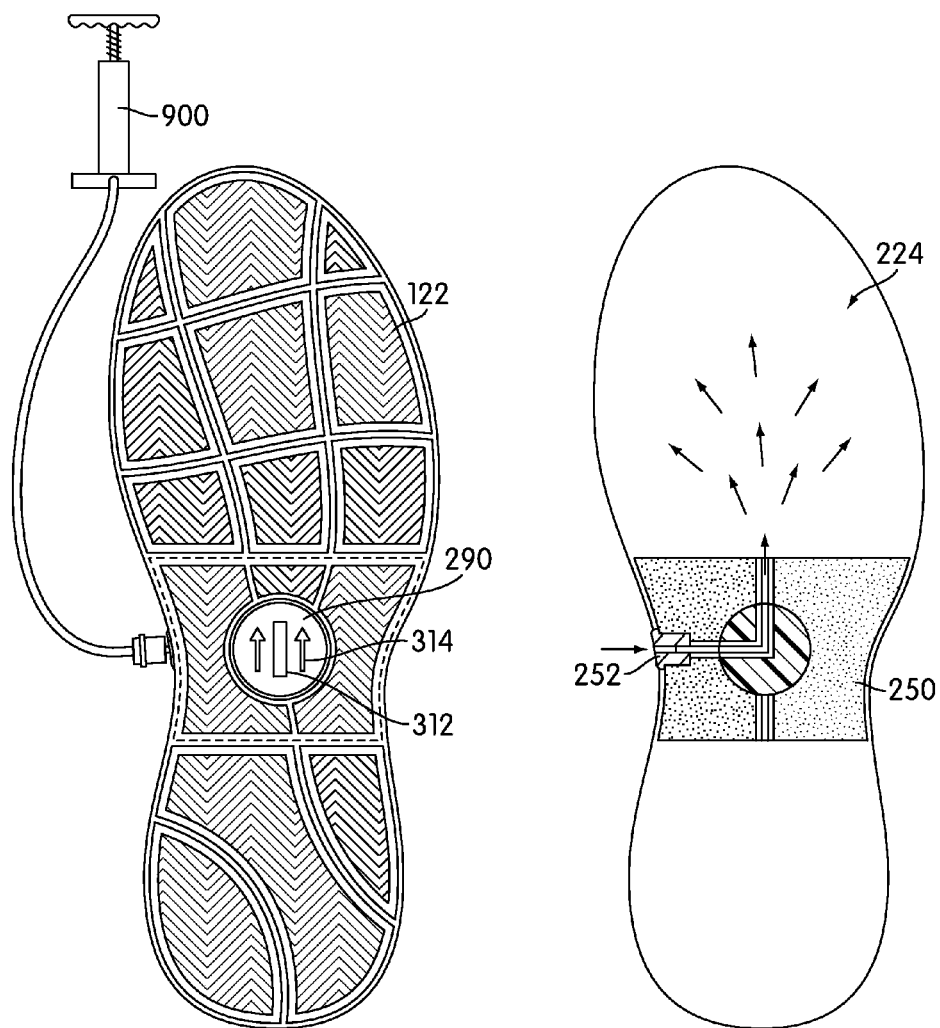


FIG. 10

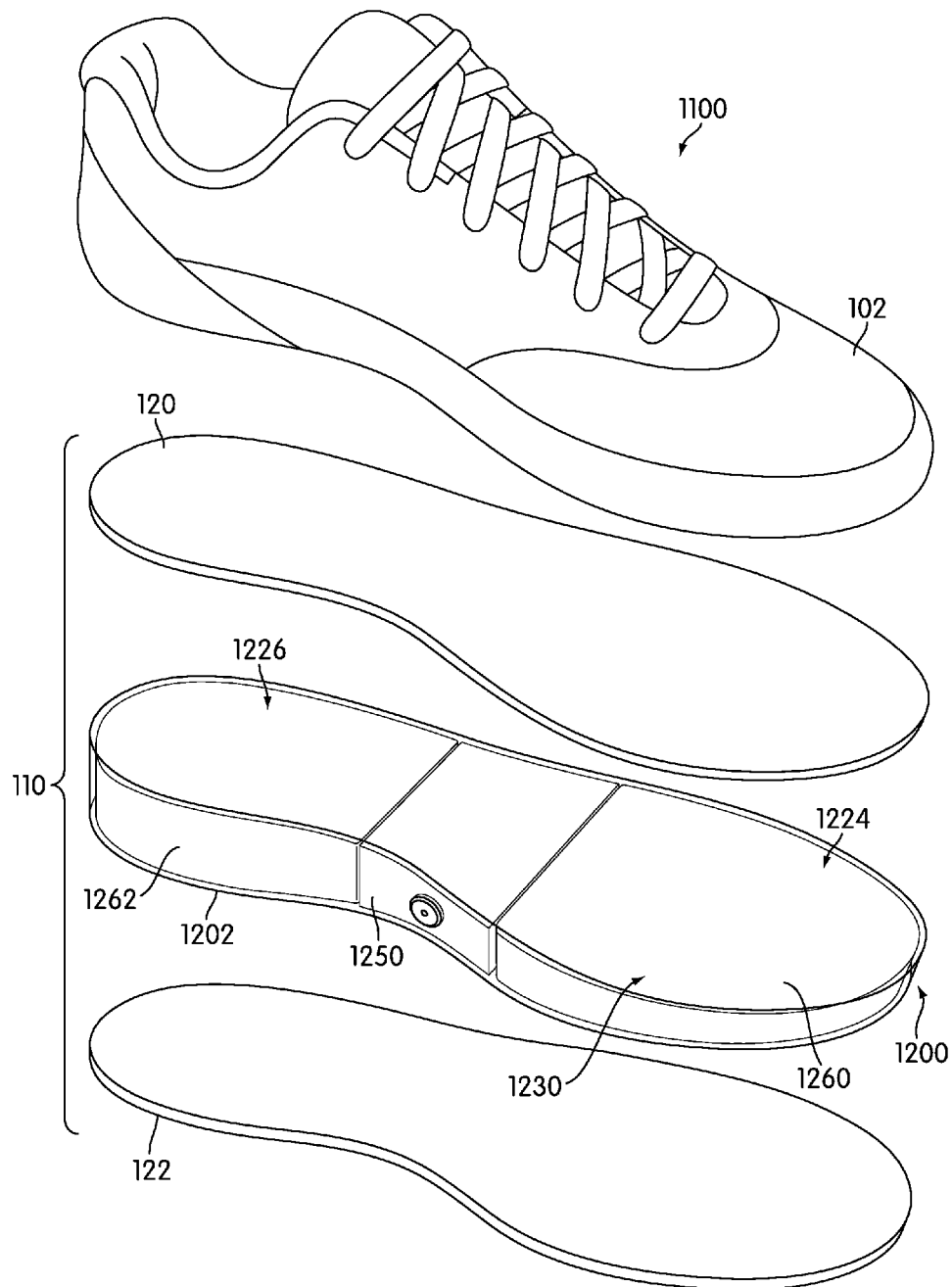


FIG. 11

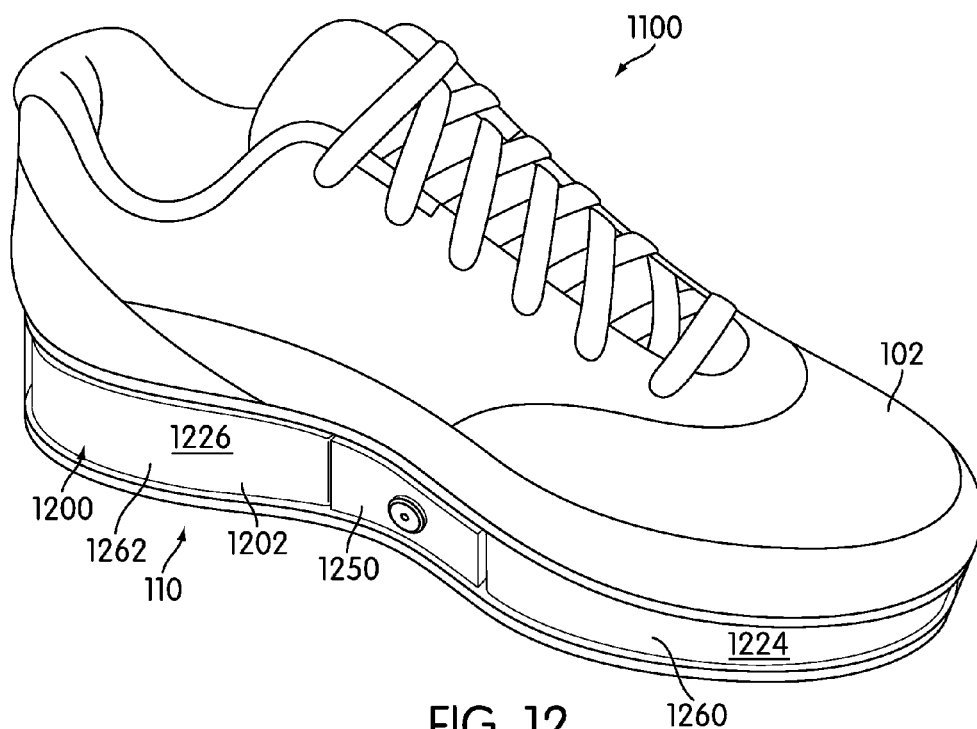
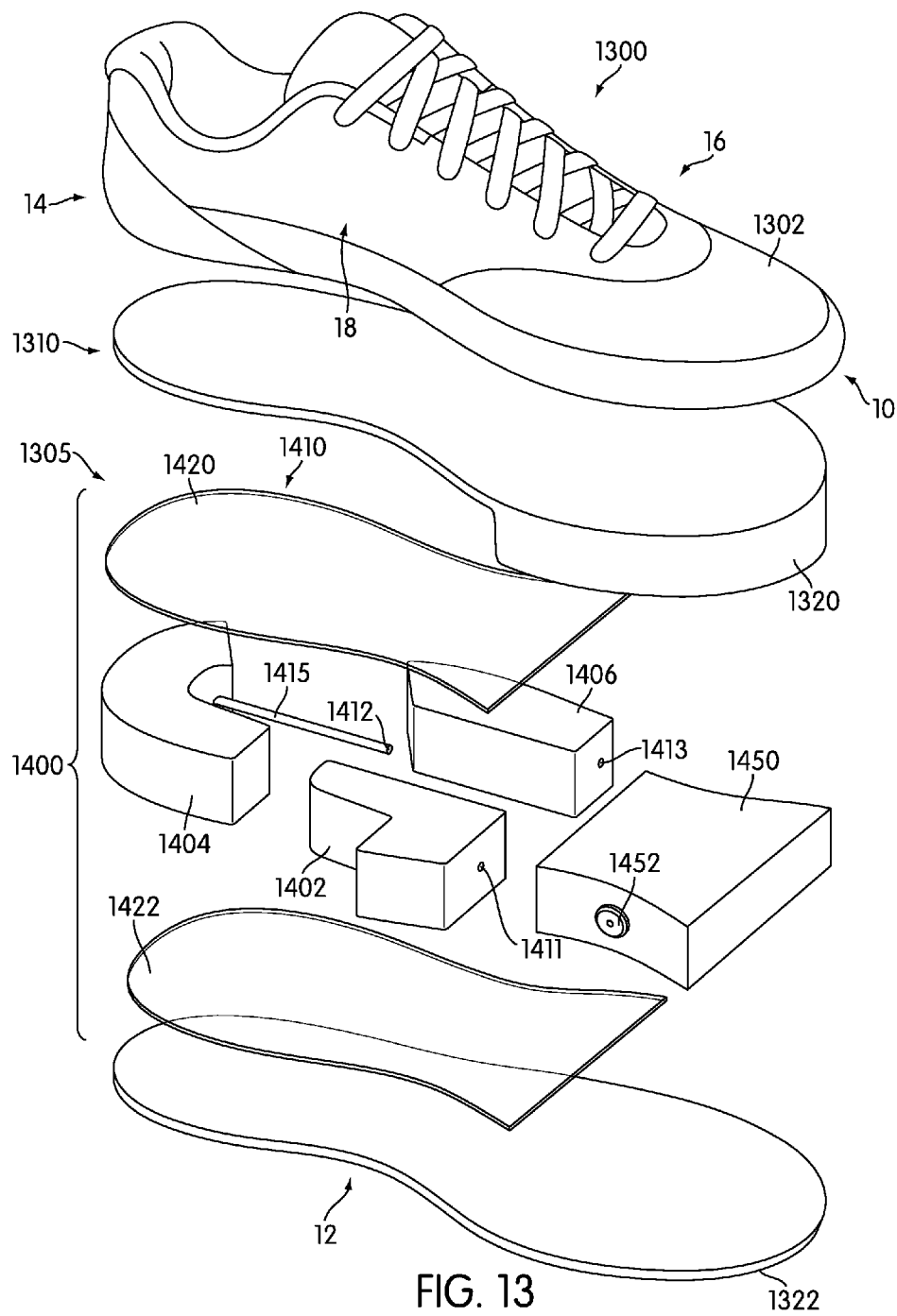


FIG. 12



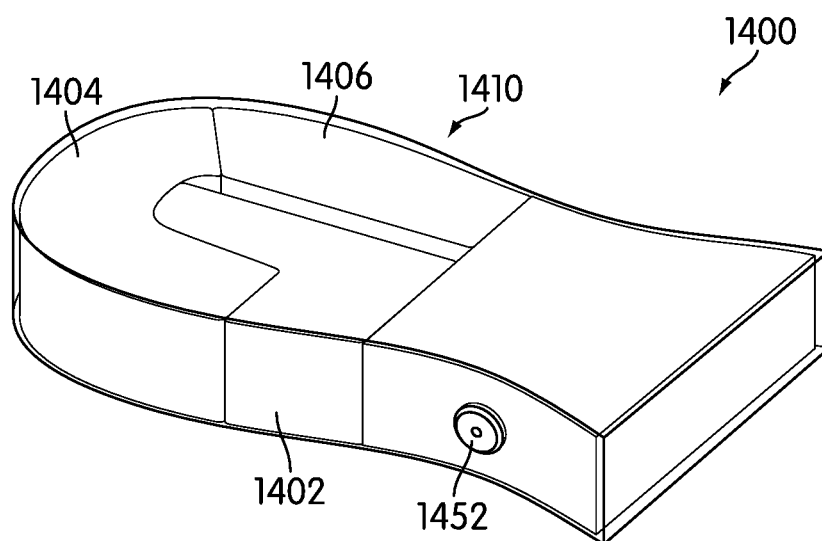


FIG. 14

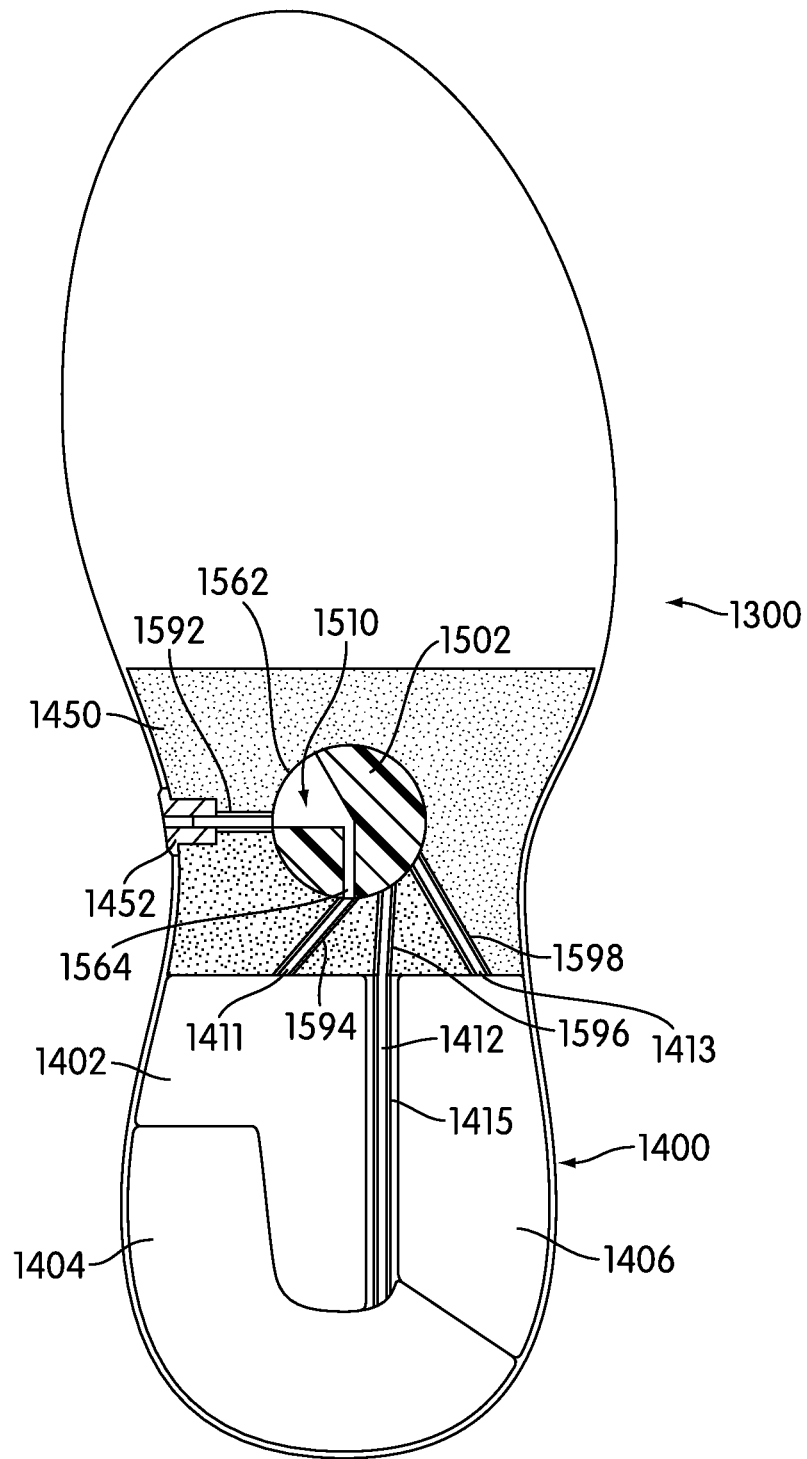


FIG. 15



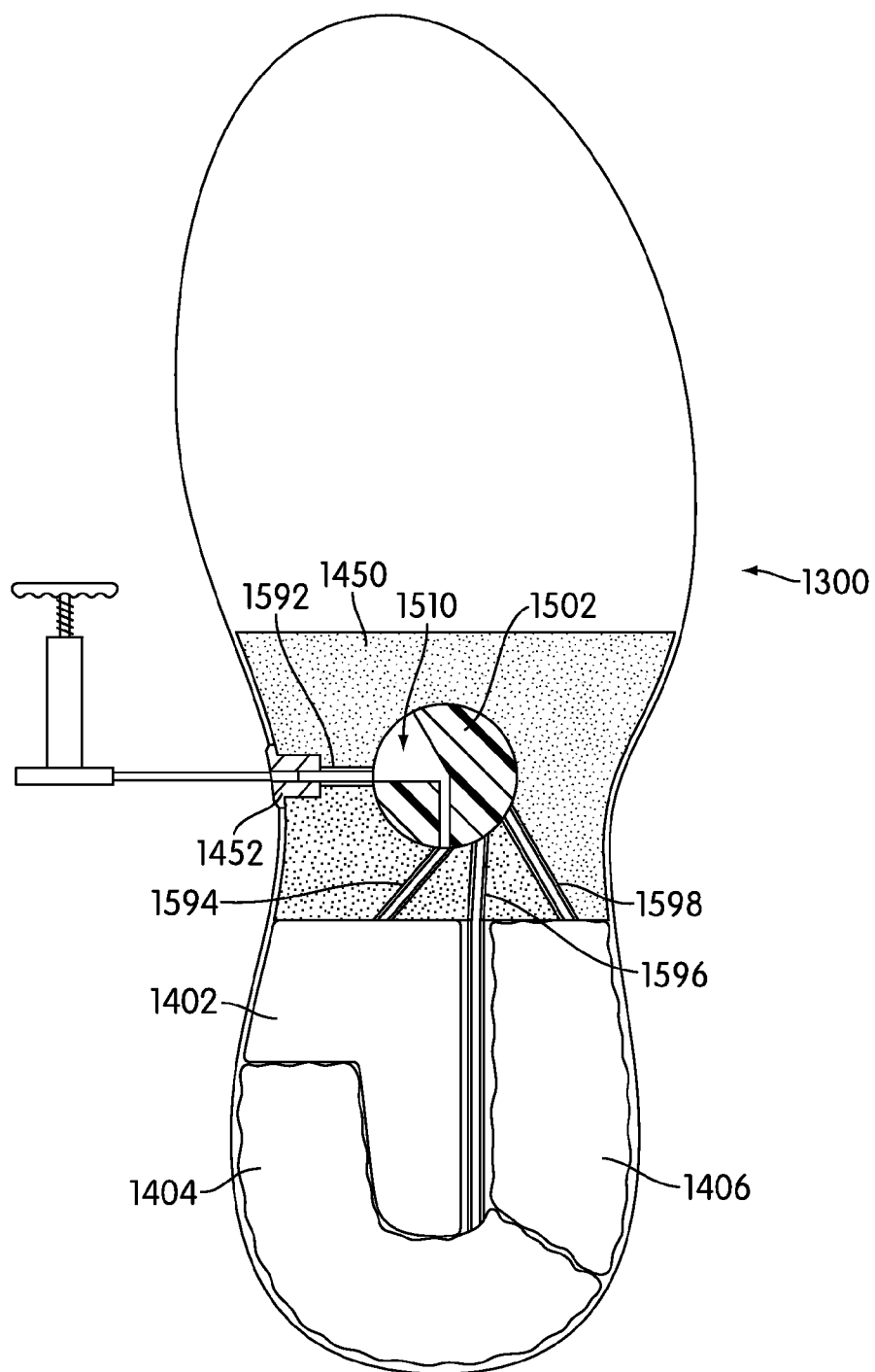


FIG. 16

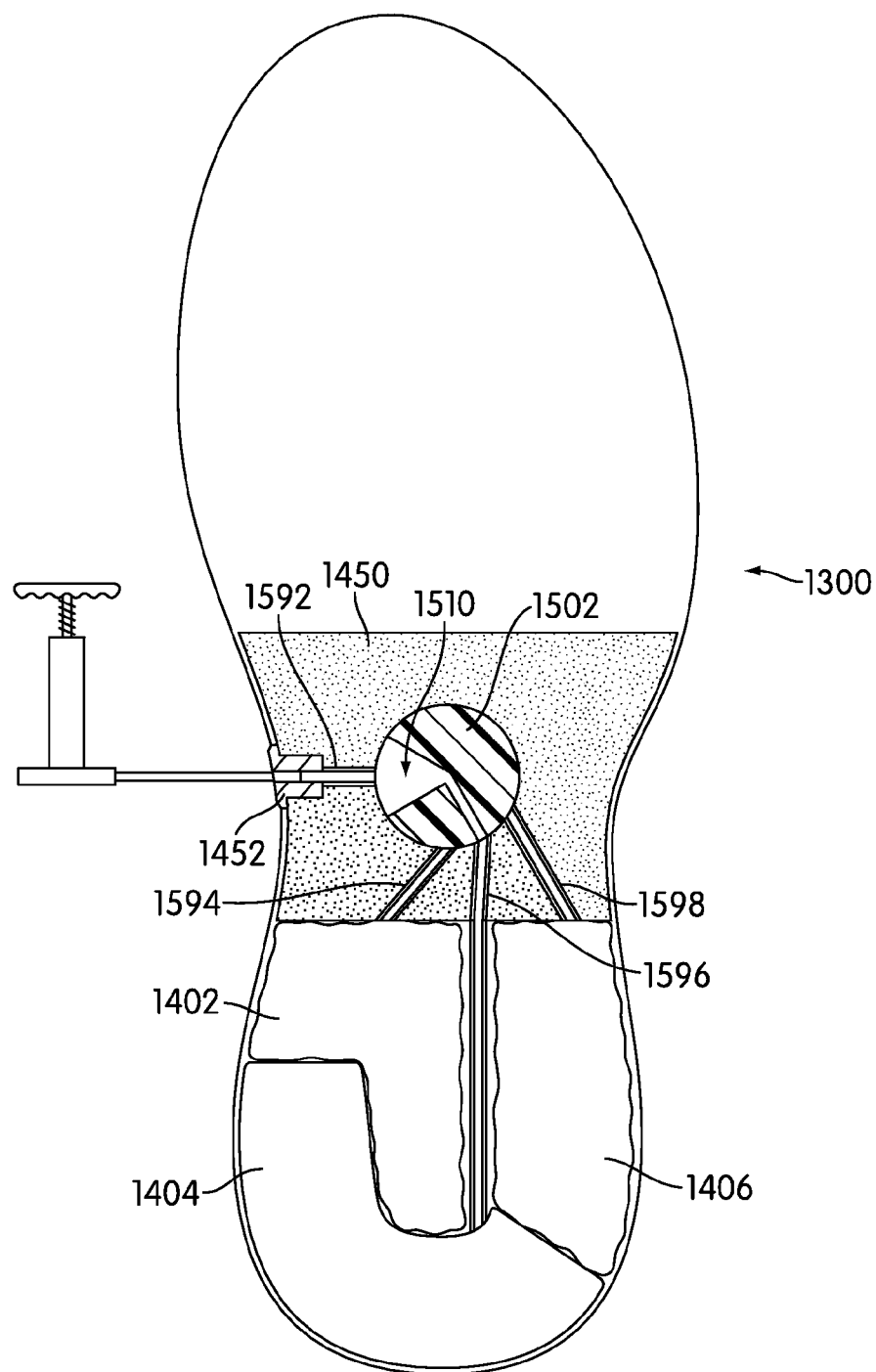


FIG. 17

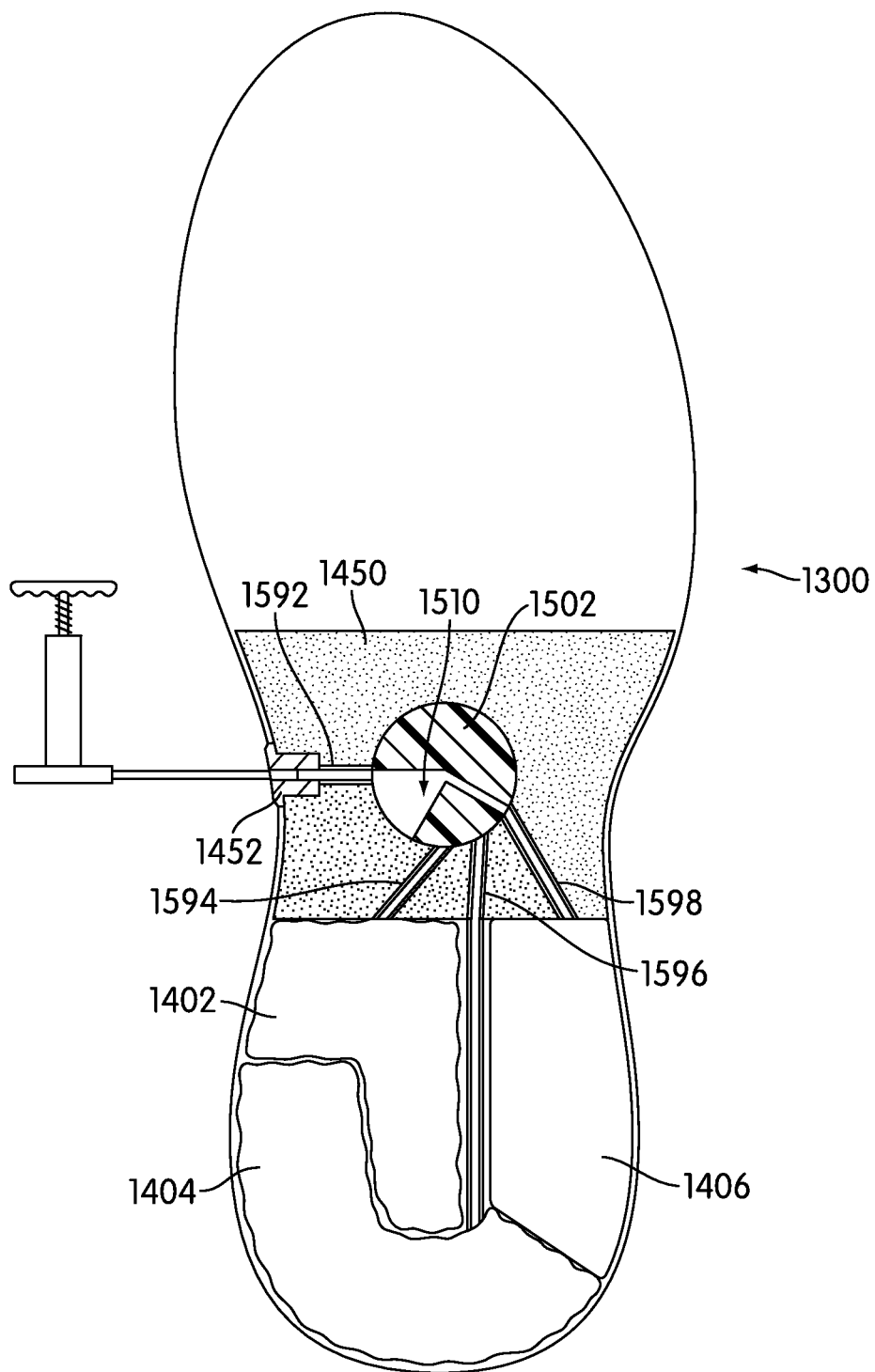


FIG. 18

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## ADJUSTABLE MULTI-BLADDER SYSTEM FOR AN ARTICLE OF FOOTWEAR

### BACKGROUND

The present embodiments relate generally to an article of footwear, and in particular to an article of footwear with a bladder system.

### SUMMARY

In one aspect, a bladder system for an article of footwear, comprises a sole structure; an outer bladder including an interior cavity; a valve member disposed inside the interior cavity, the valve member being used to inflate the interior cavity; and where the valve member divides the interior cavity into a first inflation chamber and a second inflation chamber and wherein the first inflation chamber and the second inflation chamber can be inflated to different pressures.

In another aspect, a bladder system for an article of footwear, comprises: a sole structure; an outer bladder including an interior cavity; a valve member disposed inside the interior cavity, the valve member being used to inflate the interior cavity; the valve member dividing the interior cavity into a first inflation chamber and a second inflation chamber; the valve member including a first fluid passage in fluid communication with a first valve; the valve member including a second fluid passage in fluid communication with the first inflation chamber and a third fluid passage in fluid communication with the second inflation chamber; the valve member including a second valve; and where a first position of the second valve provides fluid communication between the first fluid passage and the second fluid passage and wherein a second position of the second valve provides fluid communication between the first fluid passage and the third fluid passage.

In another aspect, a bladder system for an article of footwear, comprises: a sole structure; an outer bladder including an interior cavity; the interior cavity being divided into a first inflation chamber and a second inflation chamber by a valve member, wherein the first inflation chamber and the second inflation chamber can be inflated to different pressures; the valve member including a valve used to control the flow of fluid into the first inflation chamber and the second inflation chamber; and where an outer surface of the valve is exposed on a lower portion of the sole structure and wherein the outer surface can be engaged to adjust the valve.

Other systems, methods, features and advantages of the embodiments will be, or will become, apparent to one of ordinary skill in the art upon examination of the following figures and detailed description. It is intended that all such additional systems, methods, features and advantages be included within this description and this summary, be within the scope of the embodiments, and be protected by the following claims.

### BRIEF DESCRIPTION OF THE DRAWINGS

The embodiments can be better understood with reference to the following drawings and description. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the embodiments. Moreover, in the figures, like reference numerals designate corresponding parts throughout the different views.

FIG. 1 is an isometric view of an embodiment of an article of footwear with a bladder system;

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FIG. 2 an isometric exploded view of an embodiment of an article of footwear with a bladder system;

FIG. 3 is an isometric exploded view of an embodiment of a bladder system;

FIG. 4 is a side view of an embodiment of an article of footwear with a bladder system;

FIG. 5 is a side view of an embodiment of a bladder system;

FIG. 6 is a cutaway view of an embodiment of a bladder system;

FIG. 7 is an isometric view of an embodiment of a lower side of a valve member;

FIG. 8 is an isometric view of an embodiment of an upper side of a valve member;

FIG. 9 is a schematic view of an embodiment of an inflation position for a bladder system configured to provide fluid to a heel portion of a bladder system;

FIG. 10 is a schematic view of an embodiment of an inflation position for a bladder system configured to provide fluid to a forefoot portion of a bladder system;

FIG. 11 is an isometric exploded view of an alternative embodiment an article of footwear with a bladder system;

FIG. 12 is an isometric view of an alternative embodiment of an article of footwear with a bladder system;

FIG. 13 is an isometric exploded view of an embodiment of an article of footwear with multiple bladders;

FIG. 14 is an isometric view of an embodiment of an article of footwear with multiple bladders;

FIG. 15 is a cross-sectional view of an embodiment of an article of footwear with multiple bladders;

FIG. 16 is a cross-sectional view of an embodiment of an article of footwear with multiple bladders;

FIG. 17 is a cross-sectional view of an embodiment of an article of footwear with multiple bladders; and

FIG. 18 is a cross-sectional view of an embodiment of an article of footwear with multiple bladders.

### DETAILED DESCRIPTION

FIGS. 1 through 4 illustrate views of an exemplary embodiment of article of footwear 100. For clarity, the following detailed description discusses an exemplary embodiment, in the form of a sports shoe, but it should be noted that the present embodiments could take the form of any article of footwear including, but not limited to: hiking boots, soccer shoes, football shoes, sneakers, rugby shoes, basketball shoes, baseball shoes as well as other kinds of shoes. As shown in FIGS. 1 through 4, article of footwear 100, also referred to simply as article 100, is intended to be used with a left foot; however, it should be understood that the following discussion may equally apply to a mirror image of article of footwear 100 that is intended for use with a right foot.

Referring to FIGS. 1 through 4, for purposes of reference, article 100 may be divided into forefoot portion 10, midfoot portion 12 and heel portion 14. Forefoot portion 10 may be generally associated with the toes and joints connecting the metatarsals with the phalanges. Midfoot portion 12 may be generally associated with the arch of a foot. Likewise, heel portion 14 may be generally associated with the heel of a foot, including the calcaneus bone. In addition, article 100 may include lateral side 16 and medial side 18. In particular, lateral side 16 and medial side 18 may be opposing sides of article 100. Furthermore, both lateral side 16 and medial side 18 may extend through forefoot portion 10, midfoot portion 12 and heel portion 14.

It will be understood that forefoot portion 10, midfoot portion 12 and heel portion 14 are only intended for purposes of description and are not intended to demarcate precise

regions of article **100**. Likewise, lateral side **16** and medial side **18** are intended to represent generally two sides of an article, rather than precisely demarcating article **100** into two halves. In addition, forefoot portion **10**, midfoot portion **12** and heel portion **14**, as well as lateral side **16** and medial side **18**, can also be applied to individual components of an article, such as a sole structure and/or an upper.

For consistency and convenience, directional adjectives are employed throughout this detailed description corresponding to the illustrated embodiments. The term “longitudinal” as used throughout this detailed description and in the claims refers to a direction extending a length of an article. In some cases, the longitudinal direction may extend from a forefoot portion to a heel portion of the article. Also, the term “lateral” as used throughout this detailed description and in the claims refers to a direction extending a width of an article. In other words, the lateral direction may extend between a medial side and a lateral side of an article. Furthermore, the term “vertical” as used throughout this detailed description and in the claims refers to a direction generally perpendicular to a lateral and longitudinal direction. For example, in cases where an article is planted flat on a ground surface, the vertical direction may extend from the ground surface upward. In addition, the term “proximal” refers to a portion of a footwear component that is closer to a portion of a foot when an article of footwear is worn. Likewise, the term “distal” refers to a portion of a footwear component that is further from a portion of a foot when an article of footwear is worn. It will be understood that each of these directional adjectives may be applied to individual components of an article, such as an upper and/or a sole structure.

Article **100** can include upper **102** and sole structure **110**. Generally, upper **102** may be any type of upper. In particular, upper **102** may have any design, shape, size and/or color. For example, in embodiments where article **100** is a basketball shoe, upper **102** could be a high top upper that is shaped to provide high support on an ankle. In embodiments where article **100** is a running shoe, upper **102** could be a low top upper.

In some embodiments, sole structure **110** may be configured to provide traction for article **100**. In addition to providing traction, sole structure **110** may attenuate ground reaction forces when compressed between the foot and the ground during walking, running or other ambulatory activities. The configuration of sole structure **110** may vary significantly in different embodiments to include a variety of conventional or non-conventional structures. In some cases, the configuration of sole structure **110** can be configured according to one or more types of ground surfaces on which sole structure **110** may be used. Examples of ground surfaces include, but are not limited to: natural turf, synthetic turf, dirt, as well as other surfaces.

Sole structure **110** is secured to upper **102** and extends between the foot and the ground when article **100** is worn. In different embodiments, sole structure **110** may include different components. For example, sole structure **110** may include an outsole, a midsole, and/or an insole. In some cases, one or more of these components may be optional. In an exemplary embodiment, sole structure **110** may include midsole **120** and outsole **122**.

In some cases, midsole **120** may be attached directly to upper **102**. In other cases, midsole **120** may be attached to a sockliner associated with upper **102**. In different embodiments, midsole **120** may have different material characteristics to provide various levels of comfort, cushioning and/or shock absorption. Examples of different materials that could

be used for midsole **120** include, but are not limited to: foam, rubber, plastic, polymers, as well as any other kinds of materials.

In some cases, outsole **122** may be configured to provide traction for sole structure **110** and article **100**. Outsole **122** can include one or more tread elements and/or ground penetrating members such as cleats. Outsole **122** can have different material characteristics to provide varying levels of traction with a ground surface. Examples of different materials that could be used for outsole **122** include, but are not limited to: plastic, rubber, polymers as well as any other kinds of materials that are both durable and wear resistant.

A sole structure can include provisions for enhancing cushioning and shock absorption for an article of footwear. Article **100** may include bladder system **200**. Generally, bladder system **200** may be disposed in any portion of article **100**. In some cases, bladder system **200** may be disposed in forefoot portion **10** of sole structure **110**. In other cases, bladder system **200** may be disposed in midfoot portion **12** of sole structure **110**. In still other cases, bladder system **200** may be disposed in heel portion **14** of sole structure **100**. In an exemplary embodiment, bladder system **200** may be a full length bladder system that extends from heel portion **14** to forefoot portion **10** of sole structure **110**.

Bladder system **200** may include outer bladder **202**. Outer bladder **202** may comprise one or more layers that are generally impermeable to fluid. In the current embodiment, outer bladder **202** comprises upper layer **220** and lower layer **222** (see FIG. 3) that are joined together at first periphery **221** and second periphery **223**. Moreover, upper layer **220** and lower layer **222** comprise a boundary surface that encloses interior cavity **230**.

Referring back to FIGS. 1 through 4, in some embodiments, bladder system **200** may include one or more structures disposed within outer bladder **202** to provide enhanced support and help maintain a substantially constant shape for outer bladder **202**. In some cases, bladder system **200** may include one or more tensile members. In some cases, bladder system **200** may include a set of stacked tensile members.

In the current embodiment, bladder system **200** includes first tensile member **204**, second tensile member **206** and third tensile member **207**. Although three tensile members are used in the current embodiment, other embodiments could include a single tensile member. Still other embodiments could include two tensile members or more than three tensile members.

Referring now to FIGS. 2 and 3, in order to provide stability and support, first tensile member **204** and second tensile member **206** may be arranged as a stacked tensile member **300** at heel portion **14** of bladder system **200**. In some cases, stacked tensile member **300** may be disposed in interior cavity **230** of outer bladder **202**. In some cases, first tensile member **204** and second tensile member **206** may be stacked in an approximately vertical direction (that is a direction perpendicular to both the longitudinal and lateral directions of article **100**).

Referring to FIG. 3, first tensile member **204** and second tensile member **206** may be spaced textiles (or spacer-knit textiles). In particular, first tensile member **204** and second tensile member **206** may include textile layers **310** as well as connecting members **312** that extend between the textile layers **310**. For example, first tensile member **204** includes first textile layer **320** and second textile layer **322**, while second tensile member **206** includes third textile layer **324** and fourth textile layer **326**. In some cases, first textile layer **320** may be attached to upper layer **220** of outer bladder **202**. Additionally, in some cases, fourth textile layer **326** may be attached to

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lower layer **222** of outer bladder **202**. Furthermore, in some cases, second textile layer **322** and third textile layer **324** may be attached to one another to join first tensile member **204** and second tensile member **206**.

Third tensile member **207** may include textile layers and connecting members. In this case, third tensile member **207** includes fifth textile layer **327** and sixth textile layer **328** that are attached to one another via connecting members **329**. In some cases, fifth textile layer **327** and sixth textile layer **328** may be attached to upper layer **220** and lower layer **222** of outer bladder **202**, respectively. In other cases, however, fifth textile layer **327** and sixth textile layer **328** may not be attached directly to outer bladder **202**.

In some embodiments, third tensile member **207** may be disposed in forefoot portion **10** of bladder system **200**. In contrast to first tensile member **204** and second tensile member **206** that form a stacked tensile member **300**, third tensile member **207** may be the only tensile member used in forefoot portion **10** of bladder system **200**. Using a single tensile member in forefoot portion **10** may help maintain a relatively low thickness for forefoot portion **10** of sole structure **110**.

In some embodiments, first tensile member **204**, second tensile member **206** and third tensile member **207** could be substantially similar to one another. In other embodiments, however, each tensile member could differ in size, shape, material characteristics as well as any other features. In the current embodiment, first tensile member **204**, second tensile member **206** and third tensile member **207** may share substantially similar material and structural properties.

Using this arrangement, first tensile member **204**, second tensile member **206** and third tensile member **207** may provide structural reinforcement for outer bladder **202**. In particular, as a compression force is applied to outer bladder **202** at heel portion **14** (such as during heel contact with a ground surface) the outward force of fluid puts connecting members **312** in tension. This acts to prevent further outward movement of textile layers **310** and thereby prevents further outward movement of outer bladder **202** at heel portion **14**. This arrangement helps to control the deformation of outer bladder **202**, which might otherwise be fully compressed during heel strikes with a ground surface. In a similar manner, third tensile member **207** may help to restrict the motion of outer bladder **202** at forefoot portion **10** in order to maintain a substantially constant height and shape for forefoot portion **10** of sole structure **110**.

Examples of different configurations for a bladder including tensile members are disclosed in Swigart, U.S. Patent Publication Number US2012/0102782, published May 3, 2012 (U.S. application Ser. No. 12/938,175, filed Nov. 2, 2010), the entirety of which is hereby incorporated by reference. Further examples are disclosed in Dua, U.S. Pat. No. 8,151,486, issued Apr. 10, 2012 (U.S. application Ser. No. 12/123,612, filed May 20, 2008 and Rapaport et al., U.S. Pat. No. 8,241,451, issued Aug. 14, 2012 (U.S. application Ser. No. 12/123,646, filed May 20, 2008), the entirety of both being hereby incorporated by reference. An example of configurations for tensile members manufactured using a flat-knitting process is disclosed in Dua, U.S. Pat. No. 8,151,486, issued Apr. 10, 2012 (U.S. application Ser. No. 12/123,612, filed May 20, 2008), the entirety of which is hereby incorporated by reference.

Bladder system **200** can include valve member **250** that facilitates the inflation of outer bladder **202**. Valve member **250** is disposed within interior cavity **230** of outer bladder **202**. Valve member **250** comprises a plug-like portion that receives valve **252** and supports the transfer of fluid into outer bladder **202**. In some embodiments, valve member **250** may

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be substantially more rigid than outer bladder **202**. This arrangement helps protect valve **252** as well as any tubing or fluid lines connected to valve **252**.

For purposes of describing valve member **250**, valve member **250** may be characterized by a plurality of surfaces (see FIG. 3). In the current embodiment, valve member **250** includes first surface **261**, second surface **262**, third surface **263**, fourth surface **264**, fifth surface **265** and sixth surface **266**. First surface **261** is a forwardly oriented surface and second surface **262** is a rearwardly oriented surface. Third surface **263** is a medial surface and fourth surface **264** is a lateral surface. Fifth surface **265** is an upper surface and sixth surface **266** is a lower surface.

Valve **252** may be partially inserted into orifice **289** (see FIG. 6) of third surface **263**. In addition, valve **252** may include fluid port **253** that is exposed on an outer surface of outer bladder **202**. In some cases, valve **252** may protrude through a portion of outer bladder **202** so that valve **252** can engage with an external pump. In an exemplary embodiment, outer bladder **202** is sealed around valve **252** so that no fluid can escape.

Generally, valve **252** may be any type of valve that is configured to engage with an external pump of some kind. In one embodiment, valve **252** could be a Schrader valve. In another embodiment, valve **252** could be a Presta valve. In still other embodiments, valve **252** could be any other type of valve known in the art.

A bladder system can include provisions for dividing an outer bladder into distinct portions. In some cases, an outer bladder can be divided into one or more inflation chambers that are substantially separate from one another. In one embodiment, a valve member can be used to divide an outer bladder into two distinct inflation chambers.

In the current embodiment, valve member **250** is configured to divide interior cavity **230** into first inflation chamber **224** and second inflation chamber **226**. In particular, upper layer **220** and lower layer **222** of outer bladder **202** are configured to attach directly to third surface **263**, fourth surface **264**, fifth surface **265** and sixth surface **266**.

Outer bladder **202** may be attached to valve member **250** in any manner. In some cases, upper layer **220** and lower layer **222** may be bonded to surfaces of valve member **250** using one or more adhesives. In other cases, upper layer **220** and lower layer **222** may be bonded to surfaces of valve member **250** in any other manner. In still other cases, upper layer **220** and lower layer **222** may not be attached directly to valve member **250**, and instead valve member **250** may be squeezed between upper layer **220** and lower layer **222** in a substantially air-tight manner.

Using this configuration, valve member **250** prevents fluid communication between first inflation chamber **224** and second inflation chamber **226**. As seen in FIG. 5, which illustrates an isolated view of an embodiment of bladder system **200**, first inflation chamber **224** is bounded by portions of upper layer **220**, lower layer **222** and first surface **261** of valve member **250**. Likewise, second inflation chamber **226** is bounded by portions of upper layer **220**, lower layer **222** and second surface **262** of valve member **250**.

In different embodiments, the material properties of valve member **250** could vary. In some cases, valve member **250** may comprise a material that is substantially impermeable to some kinds of fluids, including air. This arrangement helps to prevent fluid from being exchanged between first inflation chamber **224** and second inflation chamber **226** through permeation of valve member **250**. However, in other cases, valve member **250** could comprise a material that is permeable to some types of fluid, including air. In one embodiment, the

outer surface of valve member **250** could be coated with a material that is substantially impermeable to some types of fluids.

Generally, first inflation chamber **224** and second inflation chamber **226** may be associated with any portion of article **100**. In some cases, first inflation chamber **224** may be associated with forefoot portion **10** of article **100**. Likewise, second inflation chamber **226** may be associated with heel portion **14** of article **100**. Because first inflation chamber **224** and second inflation chamber **226** can be inflated to different pressures, this configuration allows a user to selectively control the pressures associated with forefoot portion **10** and heel portion **14** of outer bladder **202**.

In the current embodiment, first tensile member **204** and second tensile member **206** are disposed inside second inflation chamber **226**. This configuration provides increased support for second inflation chamber **226**. In other embodiments, however, first tensile member **204** and second tensile member **206** could be disposed in any other inflation chambers or any other portions of article **100**. In addition, in this embodiment, third tensile member **207** is disposed in first inflation chamber **224** in order to provide increased support for outer bladder **202** at forefoot portion **10**.

A bladder system can include provisions for selectively inflating one or more inflation chambers. In some cases, a valve member can be configured with a valve that can selectively provide fluid communication between an external pump and one or more inflation chambers.

Referring to FIGS. 6 through 8, valve member **250** may be provided with one or more fluid passages. In the current embodiment, valve member **250** may include first fluid passage **292**, second fluid passage **294** and third fluid passage **296**. In particular, first fluid passage **292** is a fluid passage that extends inwardly from valve **252**. Second fluid passage **294** is a fluid passage that is in fluid communication with first inflation chamber **224**. Third fluid passage **296** is a fluid passage that is in fluid communication with second inflation chamber **226**.

It will be understood that in some cases, a tube or fluid line may be disposed within one or more fluid passages. In other cases, fluid may travel through one or more fluid passages directly, without the use of a separate tube or fluid line. In embodiments where valve member **250** is substantially impermeable to fluid, fluid passages may be used to transport fluid without additional fluid lines or tubes.

Valve member **250** may also be provided with valve **290** to provide fluid communication between first fluid passage **292** and either second fluid passage **294** or third fluid passage **296**. Valve **290** may be any type of valve. In one embodiment, valve **290** could be a ball valve. In other embodiments, valve **290** could be any other kind of valve.

In the current embodiment, valve **290** may be screwed into central bore **259** of valve member **250**. In some cases, valve **290** can include threading **320** that corresponds to threading **322** of central bore **259**. In the exemplary embodiment, valve **290** is configured to rotate within valve member **250** at the intersection of first fluid passage **292**, second fluid passage **294** and third fluid passage **296**. Moreover, valve **290** is provided with central passage **298** that is open at first orifice **302** and second orifice **304**. With this arrangement, valve **290** is configured to selectively connect either second fluid passage **294** or third fluid passage **296** to first fluid passage **292**.

In a first rotated position for valve **290**, first orifice **302** is in fluid communication with first fluid passage **292** and second orifice **304** is in fluid communication with second fluid passage **294**. This allows fluid to flow between valve **252** and first inflation chamber **224**. In a second rotated position for valve

**290**, first orifice **302** is in fluid communication with third fluid passage **296** and second orifice **304** is in fluid communication with first fluid passage **292**. This allows fluid to flow between valve **252** and second inflation chamber **226**.

Referring now to FIGS. 9 and 10, in some embodiments, the position of valve **290** may be adjusted manually. In one embodiment, outer surface **310** of valve **290** may be exposed on a lower portion of article **100**. In particular, in the current embodiment, outer surface **310** may be exposed through a hole in outsole **122**. Moreover, outer surface **310** may be provided with gripping portion **312** (see FIG. 7) that allows a user to grasp valve **290** in order to rotate the position of valve **290**. In addition, in some cases, outer surface **310** could include one or more markings or indicia that indicate the relative position of valve **290**. For example, in the current embodiment, arrow indicia **314** may be configured to indicate the relative position of valve **290**.

Referring to FIG. 9, arrow indicia **314** is pointing in the direction of heel portion **14**. This indicates to a user that when external pump **900** is used to inflate outer bladder **202**, second inflation chamber **226**, which is associated with heel portion **14**, will be inflated. This is due to a first inflation position of valve **290**, which is positioned to provide fluid communication between valve **252** and second inflation chamber **226**.

In order to selectively inflate first inflation chamber **224**, which corresponds to forefoot portion **10** of sole structure **110**, a user may rotate valve **290** manually. As seen in FIG. 10, valve **290** has been manually rotated to a second inflation position for valve **290**. In this second inflation position, valve **290** provides fluid communication between valve **252** and first inflation chamber **224**. With this configuration, as external pump **900** is used to inflate outer bladder **202**, first inflation chamber **224** is inflated.

Using this arrangement, first inflation chamber **224** and second inflation chamber **226** can be inflated to different pressures. In particular, since first inflation chamber **224** and second inflation chamber **226** are never directly in fluid communication with one another, the inflation pressure of each chamber can be separately controlled. This allows a user to independently adjust the inflation pressure of the forefoot and heel portions of an article of footwear by connecting an external pump to a single valve of the article and adjusting the flow of fluid into different regions of the sole structure using a valve.

Although the current embodiment illustrates valve **290** disposed on a lower surface of valve member **250**, which is visible on a lower portion of article **100**, in other embodiments, valve **290** could be disposed on any other portion of valve member **250**. For example, in some cases, valve **290** could be associated with a medial or lateral surface of valve member **250**. In such cases, a user could adjust valve **290** through an air-tight opening in outer bladder **202**. In other cases, valve **290** could be associated with an upper surface of valve member **250**. In such cases, valve **290** could be exposed inside of upper **102** beneath a sockliner or insert. In still other cases, valve **290** could be associated with any other surface of valve member **250** and any other portion of article **100**.

Although the current embodiment utilizes one or more tensile members to provide enhanced structural support for portions of a bladder system, other embodiments may not include any tensile members. FIGS. 11 and 12 illustrate an alternative embodiment of article of footwear **1100**. Article of footwear **1100**, hereby simply referred to as article **1100**, may be similar to article **100** in many respects. In particular, article of footwear **1000** comprises upper **102** and sole structure **110**.

Article **1100** may also include bladder system **1200**. Bladder system **1200** could be similar to bladder system **200** of the

previous embodiment. Bladder system **1200** may include outer bladder **1202** as well as valve member **1250**. Valve member **1250** may divide interior cavity **1230** into first inflation chamber **1224** and second inflation chamber **1226**. In contrast to the previous embodiment, however, bladder system **1200** may not include any tensile members. Instead, bladder system **1200** may include first inner bladder **1260** and second inner bladder **1262** that are disposed in first inflation chamber **1224** and second inflation chamber **1226**, respectively.

Generally, an inner bladder may be any type of bladder. In some cases, an inner bladder may be an inflatable bladder. In other cases, an inner bladder may not be inflatable. In other words, in some cases, the amount of fluid within the inner bladder may be fixed. In an exemplary embodiment, one or more inner bladders may be sealed bladders with approximately constant pressures. In particular, in some cases, the pressure of each inner bladder may be set at the time of manufacturing.

Examples of different types of bladders that could be used as inner bladders can be found in U.S. Pat. Nos. 6,119,371 and 5,802,738, both of which are hereby incorporated by reference. Moreover, the properties of one or more inner bladders could vary. Some may include internal structures that enhance support and maintain resiliency for the bladders. Other inner bladders may comprise a single outer layer that encloses an interior cavity. In still other embodiments, one or more inner bladders could have any other material and/or structural properties.

In different embodiments, the relative pressures of one or more bladders could vary. In one embodiment, first inner bladder **1260** and second inner bladder **1262** may be configured with substantially different internal pressures from outer bladder **1202**. For example, in one embodiment, first inner bladder **1260** and second inner bladder **1262** could have internal pressures that are substantially greater than the maximum inflation pressure of outer bladder **1202**. In other words, in some cases, the pressure of outer bladder **1202** may not be increased above the internal pressures of first inner bladder **1260** and second inner bladder **1262**. Using this arrangement, first inner bladder **1260** and second inner bladder **1262** may be substantially stiffer than outer bladder **1802**.

It will be understood that in other embodiments, the relative internal pressures of each bladder could vary. In other embodiments, for example, first inner bladder **1260** and second inner bladder **1262** could have internal pressures substantially equal to or less than the maximum inflation pressure associated with outer bladder **1202**.

In still other embodiments, an outer bladder can be filled with any other kinds of structures that provide support and enhance the operation of a bladder system. Although the current embodiments show systems including tensile members and inner bladders, other embodiments could include any other kinds of support structures that can be placed inside a bladder. One example of a bladder with various kinds of support structures is disclosed in Peyton et al., U.S. Pat. No. 8,479,412, issued Jul. 9, 2013 (U.S. application Ser. No. 12/630,642, filed Dec. 3, 2009), the entirety of which is hereby incorporated by reference. Another example is disclosed in Peyton, U.S. Pat. No. 8,381,418, issued Feb. 26, 2013 (U.S. application Ser. No. 12/777,167, filed May 10, 2010), the entirety of which is hereby incorporated by reference. An example of a bladder incorporating a foam tensile member is disclosed in Schindler, U.S. Pat. No. 7,131,218, the entirety of which is hereby incorporated by reference.

In different embodiments, a valve member could be configured to provide fluid to multiple different bladders dis-

posed in a sole structure or other portions of an article. In some cases, a valve member can be provided with one or more valves that provide selective inflation for different bladders.

FIGS. **13** and **14** illustrate an embodiment of an article of footwear including a bladder system. Referring to FIGS. **13** and **14**, article of footwear **1300**, hereby simply referred to as article **1300**, includes upper **1302** and sole structure **1310**. Upper **1302** and sole structure **1310** may be similar to upper **102** and sole structure **110** discussed in the earlier embodiments. Moreover, in the current embodiment, sole structure **1310** further includes midsole **1320** and outsole **1322**.

A sole structure can include provisions for enhancing cushioning and shock absorption for an article of footwear. Article **1300** may include bladder system **1400**. Generally, bladder system **1400** may be disposed in any portion of article **1300**. In some cases, bladder system **1400** may be disposed in forefoot portion **10** of sole structure **1310**. In other cases, bladder system **1400** may be disposed in midfoot portion **12** of sole structure **1310**. In still other cases, bladder system **1400** may be disposed in heel portion **14** of sole structure **1310**. In an exemplary embodiment, bladder system **1400** may extend through heel portion **14** and midfoot portion **12** of sole structure **1310**.

Bladder system **1400** may include one or more bladders. In the current embodiment, bladder system **1400** includes first bladder **1402**, second bladder **1404** and third bladder **1406**. Generally, the sizes and shapes of first bladder **1402**, second bladder **1404** and third bladder **1406** can vary. In the current embodiment, first bladder **1402**, second bladder **1404** and third bladder **1406** can be shaped and sized to fit together within heel portion **14** of sole structure **1310**. In particular, in the current embodiment, first bladder **1402** may be associated with medial side **18** of article **1300**, second bladder **1404** may be associated with rear end portion **1305** of article **1300** and third bladder **1406** may be associated with lateral side **16** of article **1300**. Although three bladders are shown in the current embodiment, in other embodiments, any other number of bladders could be used. Furthermore, bladders could be configured in any shapes and/or sizes.

Each of first bladder **1402**, second bladder **1404** and third bladder **1406** may be configured with one or more orifices for receiving fluid. In this embodiment, first bladder **1402**, second bladder **1404** and third bladder **1406** are configured with first orifice **1411**, second orifice **1412** and third orifice **1413** for receiving fluid. Moreover, in the current embodiment, second orifice **1412** may be associated with extended tube **1415** that extends from a surface of second bladder **1404**.

Bladder system **1400** can include valve member **1450** that facilitates the inflation of first bladder **1402**, second bladder **1404** and third bladder **1406**. Valve member **1450** comprises a plug-like portion that receives valve **1452** and supports the transfer of fluid into first bladder **1402**, second bladder **1404** and third bladder **1406**. In some embodiments, valve member **1450** may be substantially more rigid than first bladder **1402**, second bladder **1404** and/or third bladder **1406**. This arrangement helps protect valve **1452** as well as any tubing or fluid lines connected to valve **1452**.

Generally, valve **1452** may be any type of valve that is configured to engage with an external pump of some kind. In one embodiment, valve **1452** could be a Schrader valve. In another embodiment, valve **1452** could be a Presta valve. In still other embodiments, valve **1452** could be any other type of valve known in the art.

In some embodiments, first bladder **1402**, second bladder **1404** and third bladder **1404** as well as valve member **1450** may be encased within a larger outer bladder. In the current embodiment, outer bladder **1410** is configured to enclose first



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bladder 1402, second bladder 1404 and third bladder 1406. In addition, portions of valve member 1450 may also be disposed within outer bladder 1410. In the current embodiment, outer bladder 1410 comprises upper layer 1420 and lower layer 1422 that are joined together to form an outer envelope for bladder system 1400. In the current embodiment, outer bladder 1410 may not be separately inflatable from first bladder 1402, second bladder 1404 and third bladder 1406. In particular, in this case, outer bladder 1410 expands and contracts as each of first bladder 1402, second bladder 1404 and third bladder 1406 are inflated or deflated. However, in other embodiments, outer bladder 1410 could be separately inflatable.

Although the current embodiment includes an outer bladder encasing one or more bladders, in other embodiments no outer bladder may be used. Instead, first bladder 1402, second bladder 1404 and third bladder 1406 could be exposed on an outer surface of sole structure 1310.

Valve member 1450 can include provisions for selectively providing fluid communication between valve 1452 and one of first bladder 1402, second bladder 1404 and third bladder 1406. In some embodiments, valve member 1450 can be configured with a valve that can selectively provide fluid communication between an external pump and first bladder 1402, second bladder 1404 or third bladder 1406.

FIG. 15 illustrates a cross-sectional view of an embodiment of article 1300. Referring to FIG. 15, valve member 1450 may be provided with one or more fluid passages. In the current embodiment, valve member 1450 may include first fluid passage 1592, second fluid passage 1594, third fluid passage 1596 and fourth fluid passageway 1598. In particular, first fluid passage 1592 is a fluid passage that extends inwardly from valve 1452. Second fluid passage 1594 is a fluid passage that is in fluid communication with first orifice 1411 of first bladder 1402. Third fluid passage 1596 is a fluid passage that is in fluid communication with second orifice 1412 of second bladder 1404. In addition, fourth fluid passage 1598 is a fluid passage that is in fluid communication with third orifice 1413 of third bladder 1406.

Valve member 1450 may also be provided with valve 1502 to provide fluid communication between first fluid passage 1592 and either second fluid passage 1594, third fluid passage 1596 or fourth fluid passage 1598. Valve 1502 may be any type of valve. In one embodiment, valve 1502 could be a ball valve. In another embodiment, valve 1502 may be a spider valve. In other embodiments, valve 1502 could be any other kind of valve. In the exemplary embodiment, valve 1502 is configured to rotate within valve member 1450 at the intersection of first fluid passage 1592, second fluid passage 1594, third fluid passage 1596 and fourth fluid passage 1598. Moreover, valve 1502 is provided with central passage 1510 that is configured to selectively connect either second fluid passage 1594, third fluid passage 1596 or fourth fluid passage 1598 to first fluid passage 1592.

In the current embodiment, valve 1502 is configured with first orifice 1562 and second orifice 1564. First orifice 1562 is a substantially wide opening that maintains fluid communication with first fluid passage 1592 in various inflation positions. Second orifice 1564 is a substantially narrow opening that maintains fluid communication with a single fluid passage in various inflation positions. As valve 1502 is rotated, fluid may continue to enter central passage 1510 from first fluid passage 1592 and may be directed to a single fluid passage from second fluid passage 1594, third fluid passage 1596 and fourth fluid passage 1598, as described in detail below.

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FIGS. 16 through 18 illustrate schematic embodiments of different positions for valve 1502. Referring to FIG. 16, valve 1502 is in a first inflation position. In this first inflation position, fluid may flow from an external pump into first bladder 1402. In particular, fluid may flow into valve 1452 from an external pump. From valve 1452, fluid may flow from first fluid passage 1592 through central passage 1510 and into second fluid passage 1594. From second fluid passage 1594 the fluid may flow into first bladder 1402. Referring now to FIG. 17, valve 1502 is in a second inflation position. In this second inflation position, fluid may flow from an external pump into second bladder 1404. In particular, fluid may flow into valve 1452 from an external pump. From valve 1452, fluid may flow from first fluid passage 1592 through central passage 1510 and into third fluid passage 1596. From third fluid passage 1596 the fluid may flow into second bladder 1404. Referring now to FIG. 18, valve 1502 is in a third inflation position. In this third inflation position, fluid may flow from an external pump into third bladder 1406. In particular, fluid may flow into valve 1452 from an external pump. From valve 1452, fluid may flow through first fluid passage 1592 through central passage 1510 and into fourth fluid passage 1598. From fourth fluid passage 1598 the fluid may flow into third bladder 1406.

Using this arrangement, a user may selectively inflate each of first bladder 1402, second bladder 1404 and third bladder 1406. In particular, each bladder may be inflated to different pressures to provide different cushioning characteristics for a medial side, lateral side, and rearward side of a heel.

Although a mechanism for operating valve 1502 is not explicitly illustrated, it will be understood that in some embodiments, valve 1502 could be operated in a substantially similar manner to the operation of valve 290 of the earlier embodiments. In particular, a portion of valve 1502 may be exposed on a lower surface of outsole 1322. Moreover, a user may twist valve 1502 to select between various different bladders.

Additionally, while the current embodiment includes three bladders disposed in a heel portion, in other embodiments, multiple bladders could be associated with various different portions of an article. Moreover, in some cases, a valve member could be configured to divide two or more bladders from one another in a manner similar to the configuration discussed earlier.

In still other embodiments, a multi-bladder system could be configured with a single inlet valve that inflates multiple bladders simultaneously. In order to achieve differential pressure within the different bladders, each bladder could be configured with an outlet valve that allows the pressure to be reduced to a desired internal pressure. In some cases, the outlet valve could be a pressure relief valve that automatically adjusts the internal pressure of the associated bladder so that the internal pressure of the bladder is never above a predetermined pressure.

While various embodiments of the embodiments have been described, the description is intended to be exemplary, rather than limiting and it will be apparent to those of ordinary skill in the art that many more embodiments and implementations are possible that are within the scope of the embodiments. Accordingly, the embodiments are not to be restricted except in light of the attached claims and their equivalents. Also, various modifications and changes may be made within the scope of the attached claims.

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What is claimed is:

1. A bladder system for an article of footwear, comprising:  
a sole structure having a forefoot portion, a heel portion,  
and a midfoot portion in between the forefoot portion  
and the heel portion;  
an outer bladder including an interior cavity;  
wherein the outer bladder is disposed in the sole structure  
and extends from the forefoot portion of the sole struc-  
ture to the heel portion of the sole structure;  
a valve member disposed inside the interior cavity, the  
valve member being used to inflate the interior cavity;  
wherein the valve member includes a first valve configured  
to receive fluid from an external pump;  
wherein the valve member extends from a lateral side of the  
outer bladder to a medial side of the outer bladder, and  
from a lower layer of the outer bladder to an upper layer  
of the outer bladder, such that the valve member occu-  
pies a full width of the interior cavity of the outer blad-  
der;  
wherein outer surfaces of the valve member are in contact  
with the outer bladder in a substantially air-tight manner  
such that the valve member pneumatically divides the  
interior cavity into a first inflation chamber in the fore-  
foot portion of the sole structure and a second inflation  
chamber in the heel portion of the sole structure;  
wherein the valve member includes a second valve in fluid  
communication with the first valve;  
wherein in a first position the second valve provides fluid  
communication between the first valve and the first  
inflation chamber and prevents fluid communication  
between the first valve and the second inflation chamber;  
wherein in a second position the second valve provides  
fluid communication between the first valve and the  
second inflation chamber and prevents fluid communi-  
cation between the first valve and the first inflation  
chamber; and  
wherein the first inflation chamber and the second inflation  
chamber can be inflated to different pressures.
2. The bladder system according to claim 1, wherein the  
outer surfaces of the valve member are bonded to the outer  
bladder to provide a substantially air-tight seal.
3. The bladder system according to claim 1, wherein the  
valve member is substantially more rigid than the outer blad-  
der.
4. The bladder system according to claim 1, wherein a first  
forwardly-oriented substantially-vertical surface of the valve  
member bounds a portion of the first inflation chamber and  
wherein a second rearwardly-oriented substantially-vertical  
surface of the valve member bounds a portion of the second  
inflation chamber.
5. The bladder system according to claim 1, further com-  
prising:  
a first tensile member disposed inside the first inflation  
chamber; and  
a second tensile member disposed inside the second infla-  
tion chamber.
6. The bladder system according to claim 5, wherein the  
second tensile member is a stacked tensile member compris-  
ing a lower tensile member and an upper tensile member.
7. A bladder system for an article of footwear, comprising:  
a sole structure having a forefoot portion, a heel portion,  
and a midfoot portion in between the forefoot portion  
and the heel portion;  
an outer bladder including an interior cavity;  
wherein the outer bladder is disposed in the sole structure  
and extends from the forefoot portion of the sole struc-  
ture to the heel portion of the sole structure;

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- a valve member disposed inside the interior cavity, the  
valve member being used to inflate the interior cavity;  
wherein the valve member extends from a lateral side of the  
outer bladder to a medial side of the outer bladder, and  
from a lower layer of the outer bladder to an upper layer  
of the outer bladder, such that the valve member occu-  
pies a full width of the interior cavity of the outer blad-  
der;  
wherein the valve member forms an air-tight divider across  
the full width of the interior cavity so as to pneumatically  
divide the interior cavity into a first inflation chamber in  
the forefoot portion of the sole structure and a second  
inflation chamber in the heel portion of the sole struc-  
ture;  
the valve member including a first fluid passage in fluid  
communication with a first valve having an exposed  
fluid port configured to receive fluid from a source exter-  
nal to the article of footwear;  
the valve member including a second fluid passage in fluid  
communication with the first inflation chamber and a  
third fluid passage in fluid communication with the sec-  
ond inflation chamber;  
the valve member including a second valve in fluid com-  
munication with the first valve through the first fluid  
passage; and  
wherein a first position of the second valve provides fluid  
communication between the first fluid passage and the  
second fluid passage and wherein a second position of  
the second valve provides fluid communication between  
the first fluid passage and the third fluid passage.
8. The bladder system according to claim 7, wherein the  
second valve prevents fluid communication between the first  
fluid passage and the third fluid passage in the first position.
9. The bladder system according to claim 8, wherein the  
second valve prevents fluid communication between the first  
fluid passage and the second fluid passage in the second  
position.
10. The bladder system according to claim 7, wherein the  
second valve is disposed in a central bore of the valve mem-  
ber;  
wherein the second valve rotates within the central bore of  
the valve member at an intersection of the first fluid  
passage, the second fluid passage, and the third fluid  
passage;  
wherein the second valve has a central passage that is open  
at a first orifice and a second orifice;  
wherein in the first position, the first orifice is in fluid  
communication with the first fluid passage and the sec-  
ond orifice is in fluid communication with the second  
fluid passage;  
wherein in the second position, the second orifice is in fluid  
communication with the first fluid passage and the first  
orifice is in fluid communication with the third fluid  
passage;  
wherein the second valve has an outer surface exposed on  
a lower surface of the sole structure; and  
wherein the outer surface of the second valve includes a  
gripping portion for turning the second valve between  
the first position and the second position.
11. The bladder system according to claim 7, wherein the  
first valve is configured to receive fluid from an external  
pump.
12. The bladder system according to claim 10, wherein the  
outer surface of the second valve includes indicia that indicate  
whether the second valve is in the first position or the second  
position.

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13. The bladder system according to claim 7, further comprising a tensile member disposed in the first inflation chamber;

wherein the tensile member comprises a first textile layer, a second textile layer, and connecting members extending between the first textile layer and the second textile layer;

wherein the first textile layer is attached to the upper layer of the outer bladder; and

wherein the second textile layer is attached to the lower layer of the outer bladder.

14. A bladder system for an article of footwear, comprising:

a sole structure having a forefoot portion, a heel portion, and a midfoot portion in between the forefoot portion and the heel portion;

an outer bladder including an interior cavity;

wherein the outer bladder is disposed in the sole structure and extends from the forefoot portion of the sole structure to the heel portion of the sole structure;

a valve member disposed inside the interior cavity;

wherein the valve member includes a first valve configured to receive fluid from a source external to the article of footwear;

wherein the valve member extends from a lateral side of the outer bladder to a medial side of the outer bladder, and from a lower layer of the outer bladder to an upper layer of the outer bladder, such that the valve member occupies a full width of the interior cavity of the outer bladder;

wherein the valve member seals a full width of the outer bladder from a medial side of the outer bladder to a lateral side of the outer bladder, so as to pneumatically divide the interior cavity into a first inflation chamber in the forefoot portion of the sole structure and a second inflation chamber in the heel portion of the sole structure, wherein the first inflation chamber and the second inflation chamber can be inflated to different pressures; the valve member including a second valve used to control the flow of fluid into the first inflation chamber and the second inflation chamber; and

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wherein an outer surface of the second valve is exposed on a lower portion of the sole structure and wherein the outer surface can be engaged to adjust the second valve.

15. The bladder system according to claim 14, wherein the valve member is bonded to an upper layer of the outer bladder and to a lower layer of the outer bladder;

wherein the first inflation chamber is formed from boundary surfaces consisting essentially of the upper layer of the outer bladder, the lower layer of the outer bladder, and a forwardly-oriented surface of the valve member; and

wherein the second inflation chamber is formed from boundary surfaces consisting essentially of the upper layer of the outer bladder, the lower layer of the outer bladder, and a rearwardly-oriented surface of the valve member.

16. The bladder system according to claim 15, wherein the valve member is configured to receive fluid from an external pump.

17. The bladder system according to claim 14, wherein the outer surface of the second valve is exposed through a hole in an outsole of the sole structure;

wherein the hole is disposed in a lower surface of the sole structure; and

wherein the outer surface of the second valve faces in a ground-contacting direction.

18. The bladder system according to claim 14, wherein the outer bladder is divided into more than two inflation chambers.

19. The bladder system according to claim 14, wherein a first forwardly-oriented surface of the valve member bounds a portion of the first inflation chamber and wherein a second rearwardly-oriented surface of the valve member bounds a portion of the second inflation chamber.

20. The bladder system according to claim 14, wherein the second valve is disposed in a central bore of the valve member;

wherein the second valve rotates within the central bore of the valve member; and

wherein the outer surface of the second valve includes a gripping portion for turning the second valve between the first position and the second position.

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